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TAXONOMIC APPROACHES TO ENLISTED OCCUPATIONAL CLASSIFICATION: VOLUME I

Diane M. Ramsey-Klee

R-K Research and System Design
Malibu, California 90265

Reviewed by
Martin F. Wiskoff

Approved by
James J. Regan
Technical Director

Navy Personnel Research and Development Center
San Diego, California 92152

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Task inventory data for five representative Navy enlisted ratings were studied to (1) define the taxonomic structure underlying the design of the Navy Occupational Task Analysis Program's task inventory booklets and (2) develop alternative taxonomic methodologies that will extend the usefulness of the task inventory data and shorten the task inventories, thereby reducing time demands on operational units during their administration. The following ratings were studied: Aviation Boatswain's Mate (AB), Aviation Machinist's Mate (AD), Electronics Technician (ET), Torpedoman's Mate (TM), Cont'

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and Yeoman (YN). Surveying the literature showed that no published taxonomic methodology could be applied directly to improve the task inventory booklets, but elements of the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards were incorporated into a composite content analytic methodology. Additionally, a clustering methodology was developed. Applying the content analytic methodology to the task inventory data demonstrated that this procedure can be used effectively to compare Navy ratings, relate task analysis data to occupational standards, and systematically generate task statements. Applying the clustering technique to the same data showed that while some of the informal job titles requested in the inventories correspond to well-defined clusters derived from task statements and thus appear to be universally understood, others do not. This suggests that the job title section should be dropped from the task inventory booklets, since the job titles serve no useful purpose that justifies their identification for central management use.

FOREWORD

This study was conducted in support of Exploratory Development Task Area ZF55-521.031 (Occupational Structures and Methodology). The report is intended for use by the Occupational Classification Department of the Naval Military Personnel Command (NMPC-5), specifically, the Naval Occupational Development and Analysis Center (NODAC). It is deemed to be of interest also to the Instructional Program Development Centers of the Chief of Naval Education and Training.

The objective of this project is to develop new or refined techniques to improve occupational classification systems. This study developed and evaluated alternate taxonomic approaches to occupational classification that would improve the usefulness of the task analysis inventories administered as part of the Navy Occupational Task Analysis Program (NOTAP). Administering these inventories to job incumbents imposes severe time demands on operational units, and it is important to limit the size of the inventories to minimize these demands. A related study is designed to determine the optimal sample size for stability and accuracy of derived job description profiles and thus reduce the number of job incumbents that must be sampled.

Volume II of this report is available upon request from the Navy Personnel Research and Development Center (Code 310). It includes the following appendices:

A--Annotated Bibliography of Publications Dealing with Taxonomic and Classificatory Methodology and Systems.

B--Rank Order of Job Titles by Frequency of Selection for Five Navy Enlisted Ratings.

C--Equipment, Tools, and Supplies used by Aviation Boatswain's Mate (AB), Aviation Machinist Mate (AD), Electronics Technician (ET), Torpedoman's Mate (TM), and Yeoman (YN).

D--Alphabetical Dictionary of the Category Labels Used in the Content Analysis.

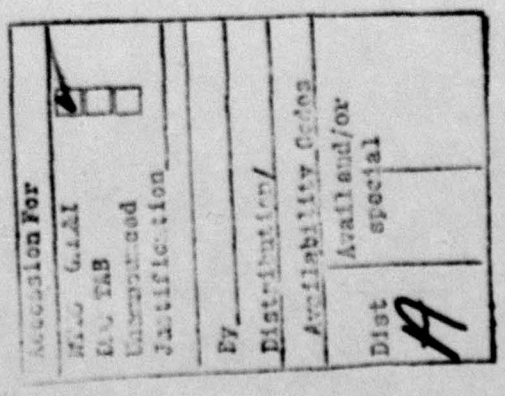
E--Alphabetical Dictionary of the Action Verbs Used in The Content Analysis.

F--Descriptive Results of the Content Analysis.

G--Matrix of Job Titles by Clusters for the Aviation Machinist's Mate (AD) Rating.

Dr. David W. Robertson was technical monitor for the contract. Dr. John J. Pass provided valuable suggestions during progress review conferences and preparation of the report.

DONALD F. PARKER
Commanding Officer



SUMMARY

Problem

Task analysis data are required for several important personnel management decisions. The necessary level of specificity for the task description varies with the particular use--from several dozen task statements to define an occupational specialty (e.g., a Navy rating in the Navy Occupational Standards Manual), to several thousand such statements to develop a curriculum for a Navy training course. Since administering task inventories to job incumbents imposes severe time demands on operational units, it is important to limit both the size of the inventory and the number of incumbents sampled, consistent with essential uses of the data, to minimize this time demand.

Purpose

This study addresses the first of the two objectives mentioned in the Problem statement--limiting the size of the task inventory. (A related study is investigating techniques to reduce the number of incumbents that must be sampled.) To this end, it (1) defines the taxonomic structure underlying the design of the Navy Occupational Task Analysis Program's (NOTAP) task inventory booklets, and (2) presents two alternative taxonomic procedures that will shorten task inventories and extend the usefulness of task analysis data.

Approach

Five Navy enlisted ratings representing a variety of occupational areas were chosen for study: Aviation Boatswain's Mate (AB), Aviation Machinist's Mate (AD), Electronics Technician (ET), Torpedoman's Mate (TM), and Yeoman (YN). Work was done in four areas:

1. A survey of the literature was conducted to determine whether existing taxonomic methodologies could be used to improve the usefulness of the NOTAP task inventories.

2. A descriptive statistical analysis of the task inventory data was performed to compare the five Navy ratings and generate data in the form needed for one of the alternative taxonomic approaches.

3. A content analysis of the task inventory data was performed to define the taxonomic structure underlying the design of the task inventory booklets.

4. Content analytic and clustering taxonomic procedures were evaluated to determine whether they offered improved designs for the task inventory booklets.

Findings

1. Although none of the taxonomic methodologies surveyed could be used directly to analyze the task inventory data, elements of the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards and concepts from several other publications were incorporated into a composite content analytic methodology. Additionally, a comprehensive and annotated bibliography was compiled and is available as a supplement to this report.

2. Applying the composite methodology to the task inventory data demonstrated that this procedure can be used effectively to compare Navy enlisted ratings, relate task analysis data to occupational standards, and systematically generate new task statements.

3. Applying the clustering technique to the data showed that while some of the informal job titles requested in the inventories correspond to well-defined clusters derived from task statements and thus appear to be universally understood, others do not. This suggests that job titles reflect only certain kinds of jobs and do not identify these jobs as well as the derived clusters do. At best, job titles offer a useful starting point for generating brief cluster titles or descriptors. Even for this task, however, the content analytic procedure or clustering procedure might be more effective.

4. It appears that job titles serve no useful purpose that justifies their identification and analysis for central management use. Nevertheless, this should not discourage their informal use at the unit level, where they may help to build morale.

Recommendations

1. The job title section should be deleted from task inventories, thereby decreasing the time required to complete the inventory.

2. The content analytic method demonstrated in this study should be developed further, with emphasis on the highly technical equipment-oriented ratings and Navy Enlisted Classification Codes, and evaluated for its usefulness in the following tasks:

a. Comparing Navy enlisted ratings.

b. Linking task statements and functional duty categories to devise occupational standards, develop training curricula, and define personnel resource requirements.

c. Generating new task statements.

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DISTRIBUTION LIST

Note. These appendices, which are included in Volume II of this report, are available upon request from the Navy Personnel Research and Development Center, Code 310.

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INTRODUCTION

Problem

Task analysis data are required for several important personnel management decisions. The necessary level of specificity for the task description varies with the particular use--from several dozen task statements to define an occupational specialty (e.g., a Navy rating in the Navy Occupational Standards Manual), to several thousand such statements to develop a curriculum for a Navy training course. Since administering task inventories to job incumbents imposes severe time demands on operational units, it is important to limit both the size of the inventory and the number of incumbents sampled, consistent with essential uses of the data, to minimize this time demand.

Background

Task analysis data are gathered as part of the Navy Occupational Task Analysis Program (NOTAP) administered by the Navy Occupational Development and Analysis Center, Washington, D.C. Task inventory booklets are developed for each of the Navy enlisted ratings. A typical NOTAP task inventory booklet contains items of the following types:

1. Background information.
2. Job titles by personnel.
3. General quarters and watch duties.
4. Physical and mental characteristics.
5. Job satisfaction.
6. Collateral duties.
7. Miscellaneous duties.
8. Equipment, tools, and systems.
9. Task statements (usually organized within functional duty categories).
10. Voluntary comments.

The job titles are the unofficial titles used locally, not the official title of the Navy rating or the Navy Enlisted Classification (NEC) code for the pay grade.

Purpose

This study addresses the first of the two objectives mentioned in the Problem statement--limiting the size of the task inventory. (A related study is investigating techniques to reduce the number of incumbents that must be sampled.) To this end, it (1) defines the taxonomic structure underlying the design of the NOTAP task inventory booklets, and (2) presents two alternative taxonomic procedures that will shorten task inventories and extend the usefulness of task analysis data.

Scope

This volume is divided into four distinct sections based on the approach described on the following page. As discussed in the Foreword, Volume II provides a great deal of information to supplement each of the four basic approach sections. The first section, "A Literature Survey of Taxonomic and Classificatory Methodology and Systems," is actually a summary of an extensive literature review that was completed and included as Appendix A in Volume II. Therefore, it is very brief, as presented in this report. The remaining three sections are more extensive summaries of the research work completed, but they too have supplements in Volume II.

APPROACH

Five Navy enlisted ratings representing a variety of occupational areas were chosen for study: Aviation Boatswain's Mate (AB), Aviation Machinist's Mate (AD), Electronics Technician (ET), Torpedoman's Mate (TM), and Yeoman (YN). Magnetic tapes of task inventory booklet response data for these five ratings were made available by NOTAP and formed the data base studied in this project.

Work was done in four areas in the following sequence:

1. A survey of the literature was conducted to identify and retrieve relevant articles and publications dealing with taxonomic methodology and job-related classification systems. An annotated bibliography of 55 references was compiled.

2. A descriptive statistical analysis of the task inventory response data made available by NOTAP was performed to compare the five Navy enlisted ratings and provide data in the form needed for one of the alternative taxonomic approaches. Among the results of the analysis were five tables presenting in rank order by frequency of selection the equipment, tools, systems, and supplies that incumbents use, operate, or repair.

3. A content analysis of the NOTAP task inventory data was performed to define the taxonomic structure underlying the design of the task inventory booklets. The work involved first designing and developing appropriate content analytic techniques and then using these techniques to perform the actual content analysis.

4. Alternative taxonomic approaches to enlisted occupational classification were identified and developed. Cross-rating comparisons were made based on the results of the content analysis. Job titles, occupational clusters, and pay grades were cross-tabulated to illustrate a clustering taxonomic procedure.

A LITERATURE SURVEY OF TAXONOMIC AND CLASSIFICATORY METHODOLOGY AND SYSTEMS

Results of the literature survey showed that 55 documentations, which are cited in the reference list, are relevent to this research project.[1]

These references represent the following disciplines: Biomathematics and Biometrics, Communication, Computer Science, Education and Training, Human Factors, Job or Occupational Analysis and Classification, Microbiology, Psychology (Counseling and Learning), and Statistics.

Thirty of them were published in the 1970's, 21 in the 1960's, 3 in the 1950's, and 1 in 1942. The last, somewhat dated article was included because of the inventive approach used by the author to develop a functional pattern technique for classification of jobs in an era that predated the availability of computers for complex data analysis.

Five concern themselves with mathematical or numerical taxonomy (Hartigan, 1967; Jardine, Jardine, & Sibson, 1967; Jardine & Sibson, 1968, 1971; Lubischew, 1962). Six others discuss taxonomic methods in bacteriological or biological classification (Beers, Fisher, Megraw, & Lockhart, 1962; Beers & Lockhart, 1962; Sneath, 1957a, 1957b; Sneath & Sokal, 1973; Theologus, 1969).

Clustering methodology is the topic of five references (Borgen & Weiss, 1971; Lefkovitch, 1976; Phalen, 1975; Ruspini, 1970; Van Emden, 1971). The application of cluster analysis techniques for classifying occupational data is the subject of four additional papers (DeNisi & McCormick, 1974; Nafziger & Helms, 1974; Riccobono, Cunningham, & Boese, 1974; Shaw, DeNisi, & McCormick, 1977). The interface between measurement and statistics is discussed in yet another article (Stevens, 1968).

Twenty-nine references deal with job-related classification systems. Of these, 17 were produced during the 5-year research project entitled "Development of a Taxonomy of Human Performance" and conducted by the American Institutes for Research (Chambers, 1969; Farina, 1969; Farina & Wheaton, 1971; Fleishman, 1967a, 1967b; Fleishman, Kinkade, & Chambers, 1968; Fleishman & Stephenson, 1970; Fleishman, Teichner, & Stephenson, 1970; Levine, Romashko, & Fleishman, 1971, 1973; Levine & Teichner, 1971; Miller, 1971a, 1971b; Teichner & Whitehead, 1971; Theologus & Fleishman, 1971; Theologus, Romashko, & Fleishman, 1970; Wheaton, 1968). Other authors concerned with the development of classificatory methods for performance measurement, task analysis, and occupational data include Bergum (1966), Chiles (1967), Christensen and Mills (1967), Davis (1942), Henry (1973), McFarland (1974), Powers (1977), Reed (1967), Riccobono and Cunningham (1971a, 1971b), Silverman (1967), and Wiley (1975).

---

[1] An annotated bibliography of these references is provided in Appendix A of Volume II.

Another group of studies reports on the development of taxonomies in other areas of interest. Four focus on taxonomies in education and training (Berman, 1973; Bloom, 1956; Krathwohl, Bloom, & Masia, 1964; Stoulurow, 1964), another describes a taxonomy of communication media (Bretz, 1975).

This literature survey was disappointing in that it netted very little information of value. Wheaton (1968) conducted a literature review of classificatory systems relating to tasks and performance a decade ago and arrived at a similar conclusion, noting that conceptual schemas outnumbered attempts to develop and apply systems of classification. Apparently, the passage of 10 years has added very little to the information reservoir.

Despite this discouraging outcome, a number of important principles emerged repeatedly in the references that were reviewed. The most important of these is the distinction between taxonomy and classification. Theologus (1969) has pointed out that "taxonomy is a prerequisite for classification. That is, the organization of tasks, or of any subject matter, into groups requires the previous development of a sound logic and rationale for the organization" (p. 25). Silverman (1967) defines the taxonomic process further:

> A taxonomy involves the systematic differentiation, ordering, relating, and naming of type groups within a subject field. ... The taxonomic process involves the following steps:
>
> 1. Collecting samples of phenomena.
> 2. Describing essential features or elements.
> 3. Comparing phenomena for similarities and differences.
> 4. Developing a set of principles governing the choice and relative importance of elements.
> 5. Grouping phenomena on the basis of essential elements into increasingly exclusive categories and naming the categories.
> 6. Developing keys and devices as a means of recognizing and identifying phenomena. (p. 2)

Miller (1971b) emphasizes that "a taxonomy does not consist merely of a list of names. The substance of a taxonomy consists in the definitions accompanying the names--the instrucitons for proper use to some potential user" (p. 32). Sneath (1957b) adds, "A classification is greatly influenced by the purpose for which it is devised" (p. 184), and he considers two purposes of classification: "(i) to give names or numbers to things, which is better called enumeration or cataloging; (ii) to indicate similarity and thus to increase our ability to think about and to use our observational material" (p. 185)

Many of the articles reviewed provided a classification rather than a taxonomy, but called the set of proposed classes a taxonomy. A taxonomy, in contrast, is the set of theoretical principles, procedures, and rules that serve as the basis for classification. In the remainder of this report, care will be taken to preserve this important distinction.

Two of the 55 references are especially pertinent to the objectives of this study. In the first of these, Henry (1973) presents a brief history of the development of the Navy's currently used alpha random-numeric enlisted classification system, and he recapitulates prior research directed toward design of an optimum enlisted classification structure. The objective of this research was to determine if it is feasible to design and implement an all-digit enlisted classification system that would better serve the needs of the Navy for personnel and billet identification. The author analyzes the occupational classification systems of other U.S. military services, the Department of Defense, and the

Department of Labor. He concludes: "This analysis failed to disclose any other system that would so significantly improve the Navy's capability to identify skills and requirements as to be worth the expenditure of money and manpower necessary to develop and implement the system" (p. 33).

The second study (Wiley, 1975) addresses the potential uses of the Air Force Functional Account Code (FAC) in describing job requirements. The Functional Account Code is part of the authorization for every airman position. This 4-digit designation combines the concept of organizational level with the mission of the activity in which the position exists. Functional Account Codes are part of the manpower apportionment system of the Air Force, and they are the specific responsibility of the management engineering teams. When individuals are sequenced by FAC, the job clustering corresponds well with the Functional Account Code. Wiley concludes: "Standardization of job titles could be improved greatly through the combined efforts of the management engineering teams and Occupational Analysis. Many local usages would prove to represent the same job with different titles if reduced to common denominators" (p. 13).

The findings from this survey of the literature did not chart a clear course for this research project to follow, but a number of good ideas were gleaned, and some caveats were identified.

A COMPARISON OF THE FIVE NAVY ENLISTED RATINGS STUDIED

The task inventory response data made available by NOTAP were subjected to a descriptive statistical analysis so that the five Navy enlisted ratings could be compared. For this analysis, the data were divided into three parts based on the organization of the NOTAP job task inventory booklet. The first part contained information concerning the job incumbent's present billet and personal career. Included here was background information such as sex, amount of formal education, pay grade, the billet's primary and secondary Navy Enlisted Classification (NEC) Code, and job title. Job title data, in particular, were needed to evaluate the clustering approach to enlisted occupational classification, described later in this report. When the task inventory booklet was administered by NOTAP, each job incumbent was asked to refer to a job title listing and to select the title that most completely described his primary job. If, in his opinion, none of the listed job titles was appropriate, he was encouraged to write in a title. The incumbents' responses formed the job title data for this project.

The second part of the data contained a list of equipment, tools, systems, and supplies for the rating to which the job incumbent had responded by indicating whether he used or operated the item, repaired it, or did both.

The third part of the data contained a list of task statements for the rating to which the job incumbent had responded by indicating the proportion of time he actually spent performing each task.

There are other parts to the task inventory booklet, but these three were studied intensively for this project.

Billet and Personal Career

Sex

Table 1 shows background information, excluding job titles, for respondents to a Navy Occupational Task Inventory for the five Navy enlisted ratings studied. References in the following paragraphs are to this table. As was expected, the largest percentage of females (24.4%) occurs in the YN rating, followed by 1.4% female representation in the ET rating. The more hazardous ratings--AB, AD, and TM--contain one-half of a percent or less females in their ranks, at least in the samples that were studied.

Education

ETs and YNs had completed the most formal education, followed closely by TMs, ADs, and ABs.

Pay Grade

The pay grade distributions of sample members for each of the five ratings are not too dissimilar. When these data are grouped into three levels--apprentice, journeyman, and supervisory and management, however, the differences among ratings that do exist become more apparent. The AB sample has the largest percentage of job incumbents holding pay grades at the apprentice level, followed by YNs, ADs, ETs, and TMs. The TM sample has the largest percentage of job incumbents holding pay grades at the journeyman level, followed by ETs, ADs, YNs, and ABs. All of the ratings, with the exception of AB, have a similar percentage of job incumbents in supervisory or management pay grades--roughly 11 to 13 percent--whereas only 7.1 percent of the AB sample held supervisory or management pay grades. These differences are important to an understanding of the tasks that job incumbents perform.

Table 1

Background Information, Excluding Job Titles, For Respondents to a Navy Occupational Task Inventory Across Five Enlisted Ratings

Item	Navy Enlisted Rating AB (%)	AD (%)	ET (%)	TM (%)	YN (%)
Sex					
Male					
Frequency	1,498	2,553	2,427	732	2,088
Percentage	99.4	99.4	98.4	99.6	75.3
Female					
Frequency	7	12	34	2	677
Percentage	.5	.5	1.4	.3	24.4
No Response					
Frequency	2	3	6	1	9
Percentage	.1	.1	.2	.1	.3
TOTAL N	1,507	2,568	2,467	735	2,774
Highest Grade of Education Completed					
Less Than 8th Grade	1.5	1.0	.1	.4	.5
Completed 8th Grade	2.5	2.0	.1	1.4	.2
Some High School	30.3	22.4	2.0	12.2	4.8
Completed High School	58.6	65.9	63.7	70.7	69.3
1 Year Beyond High School	4.4	5.2	15.7	9.7	13.6
2 Years Beyond High School	1.9	2.4	12.9	3.7	7.6
More Than 2 Years Beyond High School	.5	.8	5.4	1.9	4.0
No Response	.3	.3	.1	.0	.0
Pay Grade[a]					
E-1	.2	.1	.0	.0	.0
E-2	16.0	5.5	1.9	2.2	4.0
E-3	28.5	11.7	6.2	7.7	11.0
E-4	20.8	22.1	28.9	18.0	30.7
E-5	15.5	26.2	31.5	34.1	24.5
E-6	11.8	22.0	19.9	24.9	17.5
E-7	4.8	8.4	7.9	9.7	9.6
E-8	1.5	2.4	2.6	2.9	1.9
E-9	.8	1.6	1.0	.5	.8
No Response	.1	.0	.1	.0	.0
Pay Grade Level					
Apprentice: E-1, E-2, E-3, E-4	65.5	39.4	37.0	27.9	45.7
Journeyman: E-5, E-6	27.3	48.2	51.4	59.0	42.0
Supervisory and Management: E-7, E-8, E-9	7.1	12.4	11.5	13.1	12.3
No Response	.1	.0	.1	.0	.0
Billet NEC					
No Primary NEC	77.1	43.7	23.7	44.6	91.0
No Secondary NEC	86.9	94.9	78.3	93.6	98.9

[a]E-1--Seaman Recruit, E-2--Seaman Apprentice, E-3--Seaman, E-4--Petty Officer Third Class, E-5--Petty Officer Second Class, E-6--Petty Officer First Class, E-7--Chief Petty Officer, E-8--Senior Chief Petty Officer, E-9--Master Chief Petty Officer.

NEC Code

Another background variable investigated was the primary NEC Code assigned to the billet occupied by the job incumbent. In addition to a primary NEC Code, a billet sometimes has a secondary NEC Code also. Table 1 shows the percentage of respondents in the five ratings occupying a billet without a primary and secondary NEC. The YN sample has the highest percentage of billets without either a primary or secondary NEC Code (91.0 and 98.9%, respectively), followed by the AB sample. At the other end of the continuum, over 75 percent or more of the members of the ET sample were occupying a billet with a primary NEC. A secondary billet NEC, however, was not indicated for 78 percent of all job incumbents in the five samples studied.

The most frequent primary NEC assigned to ET billets was 1598--Electronics Standards Specialists--followed by three NECs corresponding to Communication Security Devices Equipment Technicians (1431, 1436, and 1438). The two most frequent primary NECs assigned to AD billets were 8319--P-3 System Organizational Maintenance Technician and 8331--A-6 System Organizational Maintenance Technician. The two most frequent primary NECs assigned to TM billets were 0746--Advanced Undersea MK 46 Maintenance Weaponsman--and 0737--Advanced Undersea MK 37 Weaponsman. The two most frequent primary NECs assigned to AB billets were 7013--Steam Catapultman--and 7022--Aviation Gasoline Handler. The single most frequent primary NEC assigned to YN billets was 2516--Legal Clerk.

Job Titles

The job titles were arranged in rank order by frequency of selection within each of the five Navy enlisted ratings studied. These five rank orders are shown in their entirety in Appendix B, Volume II. The results are highlighted in Table 2, where only the five most frequently selected job titles are displayed for each of the five ratings. The five most frequently selected job titles in the TM sample accounted for 58.1 percent of all job titles in this rating, whereas the five most frequently selected job titles in the AB sample accounted for only 25.0 percent of all job titles in that rating. This finding reflects the existence in the AB general rating of subspecialties, termed service ratings (e.g., ABH--Hydraulics), compared to the TM rating, which has no service rating breakdown. The other three ratings studied fell in between these two percentages.

Equipment, Tools, Systems, and Supplies

The equipment, tools, systems, and supplies that job incumbents in each of the five ratings operated, used, or repaired were arranged in rank order. Results are provided in Appendix C, Volume II, which is available upon request. Table 3 presents the five types of items most frequently marked on the task inventory scale for each of the five ratings. There was much commonality among YNs in the items that they indicated. This commonality was almost as pronounced in the ET analysis. TMs also exhibited a high degree of commonality in their responses, followed by ADs. In contrast, ABs demonstrated much less commonality than the other four ratings. The findings in Table 3 appear to be obvious; however, they were not at all apparent before the rank ordering was accomplished.

Table 2

The Five Most Frequently Selected Job Titles for Five Navy Enlisted Ratings

Job Title	Number Selecting	Percentage of Sample	Cumulative Percentage
AVIATION BOATSWAIN'S MATE (AB)			
Crash Crewmember	113	7.5	7.5
Aircraft Handling Crewmember (Blueshirt)	82	5.4	12.9
Crash Truck Driver/Operator	63	4.2	17.1
Aircraft Director (Yellowshirt)	62	4.1	21.2
Section Leader	58	3.8	25.0
AVIATION MACHINIST'S MATE (AD)			
500 Laborer	245	9.5	9.5
Plane Captain	241	9.4	18.9
Work Center Supervisor	225	8.8	27.7
Maintenance Crewmember	214	8.3	36.0
Engine Build-Up Mechanic	145	5.6	41.6
ELECTRONICS TECHNICIAN (ET)			
Electronics Technician	421	17.1	17.1
Radar Technician	188	7.6	24.7
Communications Technician	185	7.5	32.2
Work Center Supervisor	177	7.2	39.4
Crypto Technician	148	6.0	45.4
TORPEDOMAN'S MATE (TM)			
Torpedo Technician (Intermediate Level Maintenance)	190	25.8	25.8
Torpedo Operator (Submarine)	94	12.8	38.6
Torpedo Operator (Surface)	58	7.9	46.5
Leading Petty Officer	44	6.0	52.5
Line Supervisor	41	5.6	58.1
YEOMAN (YN)			
Administrative Assistant	254	9.2	9.2
Administrative Office Yeoman	252	9.1	18.3
Administrative Office Supervisor	197	7.1	25.4
Officer Records Yeoman	155	5.6	31.0
Operations Yeoman	142	5.1	36.1

Table 3

The Five Types of Equipment, Tools, Systems, and Supplies Most Frequently Operated, Used, or Repaired by the Five Navy Enlisted Ratings

Equipment/Tools/Systems/Supplies	Number Selecting	Percentage of Sample
AVIATION BOATSWAIN'S MATE (AB)		
Common Hand Tools	809	53.7
CO_2 Extinguishers	643	42.7
Sound-powered Telephones	582	38.6
Hand-operated Grease Gun	561	37.2
PKP Extinguishers	537	35.6
AVIATION MACHINIST'S MATE (AD)		
Flash Light	2,041	79.5
Drip Pans	1,573	61.2
Torque Wrench	1,567	61.0
Safety Wire Pliers	1,535	59.8
Inspection Mirrors	1,477	57.5
ELECTRONICS TECHNICIAN (ET)		
Screwdrivers (such as Jewelers, Phillips, Flat)	2,225	90.2
Soldering Iron/Gun	2,196	89.0
Long Nosed Pliers	2,168	87.9
Solder (Rosin Core)	2,140	86.7
Allen Wrenches	2,116	85.8
TORPEDOMAN'S MATE (TM)		
Common Hand Tools	615	83.7
Hoisting Straps/Slings	602	81.9
Personnel Safety Clothing (Hard Hats, Steel Toe Safety Shoes, etc.)	568	77.3
Low Pressure Air System	561	76.3
Chain Falls (Manual)	519	70.6
YEOMAN (YN)		
Telephone	2,669	96.2
Electric Typewriter	2,631	94.8
Filing Cabinets	2,572	92.7
Copier (such as 3M, IBM, SCM, Dennison, Xerox)	2,536	91.4
Hole Punch	2,242	80.8

Task Statements

A different kind of comparative analysis was performed on the list of task statements for each of the five ratings. The content analysis of the task statements is the subject of the next section.

A CONTENT ANALYSIS OF TASKS PERFORMED BY JOB INCUMBENTS IN FIVE NAVY ENLISTED RATINGS

Content Analysis Methodology

Development of a content analysis methodology began with an examination of the task statements in the NOTAP task inventory booklets. These task statements fall into a set of functional duty categories that may or may not be made explicit in the task inventory booklet. In the TM booklet, the assignment of task statements to functional duty categories was specified, and the task statements were presented systematically by functional duty category. In the task inventory booklets for the other four ratings, the assignment of task statements to functional duty categories was not made explicit, although for ABs, ETs, and YNs the task statements were presented in groups that corresponded to implicit functional duty category groupings. In the AD task inventory booklet, the order of the task statements appeared to be random, or at least scrambled.

Ten functional duty categories were specified in the TM task inventory booklet, as shown in Table 4. These categories are broad and undefined, but they served as a good point of departure in developing an appropriate methodology for content analyzing the tasks performed by job incumbents in Navy enlisted ratings.

Other classification systems or taxonomies pertinent to developing an appropriate content analysis methodology were considered also. Four were found in a single publication--Manual of Navy Enlisted Manpower and Personnel and Classifications and Occupational Standards, Section-I Navy Enlisted Occupational Standards, September 1975. These four were the following: (1) the 24 Occupational Fields listed in the Table of Contents to Section I (p. vii); (2) the Standard Topic Titles from Appendix J to Section I (pp. App. J-1 to App. J-2); (3) the category headings used to describe the tasks required at each rate for a particular Navy enlisted rating; and (4) the list of Approved Action Verbs from Appendix G to Section I (pp. App. G-1 to App. G-9). Additionally, relevant taxonomies were found in several other publications (Chambers, 1969; Cunningham, Tuttle, Floyd, & Bates, 1971; Riccobono & Cunningham, 1971; Sauer, Campbell, Potter, & Askren, 1977; Silverman, 1965).

None of the classification systems or taxonomies studied could be applied with any degree of precision or reliability in a content analysis of the task statements. Therefore, the best features of each were developed into a composite methodology that employs two levels of analysis to categorize each task statement. At the first level, a category label is selected from a dictionary of applicable categories that describes the processes and activities carried out by job incumbents in Navy enlisted ratings. Then, at the second level, the most precise action verb is selected from a dictionary of applicable action verbs that characterizes the action taking place within the previously selected category. The development of these dictionaries and their use in a two-step content analysis are described in the next two sections.

Category Labels Used in the Content Analysis

The entire set of 2301 task statements contained in the task inventory booklets for the five ratings studied was read carefully in order to develop and define a comprehensive set of categories covering all tasks mentioned. A two-level hierarchy of category labels was produced. At the first, more general level, there were 21 categories, some of which were broken down into 76 additional categories at a second, more specific level. A hierarchical listing of the resulting 97 category labels is displayed in Table 5, along with the shorthand codes used in the content analysis. All category labels are defined in Appendix D, Volume II.

Table 4

Specification of Task Statements into Ten Functional Duty Categories for the Torpedoman's Mate (TM) Rating

Functional Duty	Task Statements
A. Management	1-27
B. Supervision	28-34
C. Administration	35-76
D. Training	77-101
E. Supply	102-118
F. Rating-related General Task	119-204
G. Electric or Electronic Repair	205-226
H. Organizational Maintenance	227-262
J. Intermediate Maintenance	263-321
Z. General or Military Duties	322-336

Table 5

Hierarchical Listing of the Category Labels Used in the Content Analysis

Category Label	Code
AIRCRAFT SYSTEMS	ACS
Construction/Fabrication of Aircraft Systems	CAC
Installation of Aircraft Systems	IAC
Knowledge of Aircraft Systems	KAC
Maintenance of Aircraft Systems	MAC
Operation of Aircraft Systems	OAC
Repair of Aircraft Systems	RAC
Troubleshooting of Aircraft Systems	TAC
BROADCASTING SYSTEMS	BRD
Installation of Broadcasting Systems	IBR
Maintenance of Broadcasting Systems	MBR
Repair of Broadcasting Systems	RBR
Troubleshooting of Broadcasting Systems	TBR
COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS	CCS
Installation of Communications and Cryptographic Systems	ICC
Maintenance of Communications and Cryptographic Systems	MCC
Repair of Communications and Cryptographic Systems	RCC
Troubleshooting of Communications and Cryptographic Systems	TCC
CORROSION CONTROL AND MATERIAL PRESERVATION	CMP
DATA PROCESSING/COMPUTING EQUIPMENT	DPC
Maintenance of Data Processing/Computing Equipment	MDC
Operation of Data Processing/Computing Equipment	ODC
Troubleshooting of Data Processing/Computing Equipment	TDC
ELECTRIC/ELECTRONIC EQUIPMENT	EEE
Construction/Fabrication of Electric/Electronic Equipment	CEE
Installation of Electric/Electronic Equipment	IEE
Knowledge of Electric/Electronic Equipment	KEE
Maintenance of Electric/Electronic Equipment	MEE
Repair of Electric/Electronic Equipment	REE
Troubleshooting of Electric/Electronic Equipment	TEE
ELECTRONIC WARFARE	ELW

Table 5 (Continued)

Category Label	Code
GENERAL/MILITARY DUTIES	GMD
Damage Control	DCT
Drills, Inspections, and Command Military Functions	DIC
Landing Party	LDG
Meetings, Seminars, and Conferences	MSC
Seamanship	SEA
Watch Standing	WST
Work Detail or Party	WRK
HYDRAULIC/PNEUMATIC MAINTENANCE	HPM
LOGISTICS	LOG
MANAGEMENT FUNCTIONS	MGT
Communication	COM
Controlling	CTR
Leadership and Supervision	L&S
Organization	ORG
Planning	PLN
Reporting	RPT
Representation	REP
Staffing	STF
MECHANICAL MAINTENANCE	MNM
NAVAL AVIATION OPERATIONS	NAO
Aircraft Fueling and Lubrication	AFL
Aircraft Handling	AHL
Aircraft Launch and Recovery	ALR
Aviation Support	AVS
NAVIGATION SYSTEMS	NAV
Maintenance of Navigation Systems	MNV
Repair of Navigation Systems	RNV
Troubleshooting of Navigation Systems	TNV
OFFICE MANAGEMENT	OFM
Chaplain Support	CHP
Clerical Functions	CLF
Graphics Support	GRS
Information Release/Promulgation	IRP
Information Retrieval and Data Analysis	IDA
Legal/Disciplinary Support	LDS
Maintenance of Office Equipment	MOE
Operation of Office Equipment	OOE

Table 5 (Continued)

Category Label	Code
OFFICE MANAGEMENT (Continued)	
Personnel Support	PRS
Social Functions Support	SOC
RADAR/SONAR SYSTEMS	RSS
Installation of Radar/Sonar Systems	IRS
Knowledge of Radar/Sonar Systems	KRS
Maintenance of Radar/Sonar Systems	MRS
Operation of Radar/Sonar Systems	ORS
Repair of Radar/Sonar Systems	RRS
Troubleshooting of Radar/Sonar Systems	TRS
SAFETY	SAF
SECURITY	SEC
TRAINING AND EDUCATION	T &E
Conduct of Training	COT
On-the-job Training	OJT
Training Administration	TAD
Training Development	TDV
WEAPON AND MISSILE SYSTEMS	WMS
Construction/Fabrication of Weapon and Missile Systems	CWM
Installation of Weapon and Missile Systems	IWM
Knowledge of Weapon and Missile Systems	KWM
Maintenance of Weapon and Missile Systems	MWM
Operation of Weapon and Missile Systems	OWM
Repair of Weapon and Missile Systems	RWM
Troubleshooting of Weapon and Missile Systems	TWM
WEATHER SYSTEMS	WTH
Maintenance of Weather Systems	MWS
Repair of Weather Systems	RWS
Troubleshooting of Weather Systems	TWS

A number of the category labels at the first level in the hierarchy are the same as those used for the functional duty categories in the task inventory booklet or for the 24 Occupational Fields and Standard Topic Titles of Section I from the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards. The following five labels map directly onto occupational standards taxonomies: CORROSION CONTROL AND MATERIAL PRESERVATION, GENERAL/MILITARY DUTIES, LOGISTICS, SAFETY, and SECURITY. Three additional labels incorporate parts of or combine categories used in occupational standards taxonomies, namely, HYDRAULIC/PNEUMATIC MAINTENANCE, MECHANICAL MAINTENANCE, and TRAINING AND EDUCATION. Six other categories used in occupational standards taxonomies were used at the second level in the content analysis hierarchy: AIRCRAFT HANDLING, AVIATION SUPPORT, DAMAGE CONTROL, PERSONNEL SUPPORT, SEAMANSHIP, and WATCH STANDING.

Although the functional duty categories in the TM task inventory booklet proved useful as general guides in developing category labels, the first three--MANAGEMENT, SUPERVISION, and ADMINISTRATION--could not easily be defined. Any definition of these three categories would have to take into account the differences in the tasks performed by E-7s, E-8s, and E-9s. Since these differences are clouded by controversy, it was decided to use a more precise set of categories developed earlier in a content analysis of the narrative sections of performance evaluations for senior Navy enlisted personnel (Ramsey-Klee & Richman, 1973).

In this analysis, senior enlisted personnel in Pay Grades E-7, E-8, and E-9 were considered to be junior level managers, responsible for performing technical as well as managerial functions and for supervising other enlisted men subordinate to them. The operations of a manager may differ from one organization or institution to another; however, there are eight specific functions that many authorities agree are characteristic of all managers (Koontz, 1971; Koontz & O'Donnell, 1972; Likert, 1961; Newman, Summer, & Warren, 1967; Sayles, 1964). These functions--communication, controlling, leadership and supervision, organization, planning, reporting, representation, and staffing--were included in the hierarchy at the second level under the general category label MANAGEMENT FUNCTIONS.

Another general category label was created for the Yeoman rating. OFFICE MANAGEMENT was created to encompass the functions of Yeoman Chief Petty Officers, who manager offices and perform a variety of more specific clerical and support functions. Ten second-level category labels were identified under this label.

Still another general category label was created to encompass four more specific functions needed for content analyzing task statements in the AB and AD ratings. NAVAL AVIATION OPERATIONS was used to subsume AIRCRAFT FUELING AND LUBRICATION, AIRCRAFT HANDLING, AIRCRAFT LAUNCH AND RECOVERY, and AVIATION SUPPORT. Other categories associated with naval aviation operations could be added at the second level.

A systems approach was taken to categorizing the content of task statements dealing with identifiable systems or classes of equipment. For the five ratings studied, nine such systems or classes were identified: AIRCRAFT SYSTEMS, BROADCASTING SYSTEMS, COMMUNICATIONS AND CRYPTOGRAPHIC SYSTEMS, DATA PROCESSING/COMPUTING EQUIPMENT, ELECTRIC/ELECTRONIC EQUIPMENT, NAVIGATION SYSTEMS, RADAR/SONAR SYSTEMS, WEAPON AND MISSILE SYSTEMS, and WEATHER SYSTEMS. Within each of these major categories, a standard set of seven second-level labels was applied: Construction or Fabrication of; Installation of; Knowledge of;

Maintenance of; Operation of; Repair of; and Troubleshooting of. Not all of the second-level labels must necessarily apply to a particular system or class of equipment, but the list of seven was always adequate to account for the content of the task statements.

Two first-level category labels--HYDRAULIC/PNEUMATIC MAINTENANCE and MECHANICAL MAINTENANCE functions--were added to the hierarchy to accommodate task statements that referred to maintenance functions in the context of a system but clearly denoted the functions themselves and not the system.

The present hierarchy can be expanded or revised to accommodate additional ratings. For the five ratings represented in this analysis, the 97 first- and second-level category labels proved to be adequate.

Action Verbs Used in the Content Analysis

The action verbs used in the content analysis were derived from Appendix G to Section I of the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards. As far as possible, approved action verbs contained in this appendix were selected to characterize the action taking place within a previously selected category. Not all of the approved action verbs in Appendix G were used; and it was necessary to identify and define some additions to the list. The result is documented in Appendix E, Volume II.

In many instances it was possible to establish an equivalence rule that would substitute an approved action verb for the actual verb used in the task statements. Examples are the use of "Disassemble" for "Break Down," "Lubricate" for "Grease" or "Oil," and "Requisition" for "Order." A glossary of these equivalences is shown in Table 6. Its purpose was to ensure consistency in the selection of an action verb when the task statement verb did not appear in the approved list.

Table 7 provides examples of the selection of action verbs for task statements from the task inventory booklet for the Aviation Machinist's Mate (AD) rating. It also shows the assignment of codes corresponding to the category labels listed in Table 5, thus summarizing the two-step content-analysis methodology.

Other conventions were also established to ensure consistency in applying the content analysis methodology. In certain cases, a verb more descriptive of the action taking place in the task statement could be derived from a noun rather than using the actual verb. For example, the task statement MAKE PERSONNEL ASSIGNMENTS was given the category label of STAFFING. The verb is MAKE, but the real action is the act of assignment, and this noun was used to derive the action verb ASSIGN. Similarly, in a task statement shown in Table 7--PERFORM MINOR MAINTENANCE ON GSE--the action is embodied in the word MAINTENANCE. Therefore, MAINTAIN was chosen as the action verb rather than PERFORM. One final example, also from Table 7, should suffice to make the logic of this convention clear. The task statement CONDUCT INVESTIGATIONS OF DISCIPLINARY CASES was assigned the action verb INVESTIGATE rather than CONDUCT.

If more than one verb was used in the task statement, both or all were used as action verbs--provided they were in the action verb dictionary. Thus, for the task statement REMOVE/REPLACE JET ENGINE TAILPIPES, both REMOVE and REPLACE were chosen.

Table 6

Glossary of Equivalences Between Task Statement Verbs and Approved Action Verbs

Task Statement Verb		Approved Action Verb	
For:	Act As	Use:	Serve
	Authorize		Approve
	Break Down		Disassemble
	Check		Secure
	Close Out		Terminate
	Configure		Form
	Connect		Join
	Dispatch		Send
	Dress (propeller blades)		Sharpen
	Enter		Insert
	Fill Out		Prepare
	Gage		Measure
	Grade		Score
	Grease		Lubricate
	Hook Up		Join
	Insure		Ensure
	Make Up		Construct
	Modify		Alter
	Muster		Collect
	Neutralize		Decontaminate
	Notify		Advise
	Off Load		Unload
	Oil		Lubricate
	On Load		Load
	Order		Requisition
	Peen		Alter
	Pick Up		Obtain
	Pre-set		Calibrate
	Pressurize		Activate
	Qualify		Certify
	Rebuild		Overhaul
	Repack		Replace (packing in)
	Request		Requisition
	Research		Review
	Restack		Reassemble
	Sample		Test
	Set Code IN		Calibrate
	Set Up		Rig
	Sign Off		Approve
	Take (dictation)		Record
	Take (samples)		Test
	Taxi (aircraft)		Position
	Tighten		Secure
	Top Off (a fuel tank)		Fuel
	Torque		Regulate
	Utilize		Use
	Validate		Verify

Table 7

Assignment of Category Label Codes and Selection of Action Verbs: The Two-step Content Analysis Methodology

Category Code[a]	Action Verb	AD	Task Statement[b]
RAC	Overhaul	359.	REBUILD RELIEF VALVES
RAC	Remove/Replace	360.	REMOVE/REPLACE JET ENGINE TAILPIPES
RAC	Overhaul	361.	REBUILD SELECTOR VALVES
AHL	Position	362.	TAXI AIRCRAFT (TAXI PILOT)
MAC	Clean	363.	CLEAN FILTERS
RAC	Repair	364.	REPAIR FUEL LEAKS (SHOOT WINGS, PATCH CELLS, ETC.)
RAC	Replace	365.	REPLACE WATER TIGHT SEAL IN HELICOPTER HULL
CMP	Paint	366.	PAINT AIRCRAFT COMPONENTS/PARTS
DCT	Maintain	367.	WEIGH CO_2/N_2 CYLINDERS
NMN	Clean	368.	CLEAN TOOLS
RAC	Build Up	369.	BUILD-UP LINES (HYDRAULIC, FUEL, ETC.)
AVS	Maintain	370.	PERFORM MINOR MAINTENANCE ON GSE (HEADLIGHTS, HOSES, FUSES, ETC.)
LOG	Mark	371.	PLACE IDENTIFYING MARKS ON TOOLS (PAINT, ETCH, TAPE, ETC.)
CTR	Screen	372.	SCREEN REPORT CHITS
CTR	Investigate	373.	CONDUCT INVESTIGATIONS OF DISCIPLINARY CASES
CTR	Screen	374.	SCREEN ENLISTED PERFORMANCE EVALUATIONS

[a]Codes for all of the 97 category labels are listed in Table 5.

[b]Task statements are taken from the task inventory booklet for the Aviation Machinist's Mate (AD) rating.

For PREPARE/UPDATE THE WATCH, QUARTER, AND STATION BILL, both PREPARE and UPDATE were selected as action verbs. For APPROVE/DISAPPROVE WORK REQUESTS, only APPROVE was selected because APPROVE is in the action verb dictionary and DISAPPROVE is not; additionally, DISAPPROVE is the antithesis of APPROVE, so in a sense APPROVE is adequate to represent both ends of the APPROVAL continuum.

A convention was adopted to control use of the action verb INSPECT, which presented problems early in the content analysis. This verb was reserved for actions where an actual formal inspection was conducted. For example, in the following task statements the actual verbs used were ignored and INSPECT was chosen as more descriptive: PERFORM AIRCRAFT CALENDAR INSPECTIONS; CONDUCT ZONE INSPECTIONS; and CONDUCT PERSONNEL INSPECTIONS. In other task statements where INSPECT was used in the sense of examining critically or carefully to determine the nature, condition, or quality of something, the action verb EXAMINE was used in place of INSPECT. For example, in the following task statements EXAMINE was chosen instead of INSPECT: INSPECT MAGNETIC PLUG/CHIP DETECTOR; INSPECT/CLEAN WEAPON TRANSDUCER FACE; and INSPECT, ADJUST, AND REPLACE BRUSHES ON MOTORS AND GENERATORS.

Although multiple action verbs were allowed, multiple category labels were not. For this reason, another convention was established to guide the selection of a category label when the action verbs contained in the task statement would lead to assignment to two different categories. The rule followed was to choose the label that required greater technical skill and proficiency. This judgment was tied to the definitions in the dictionary of category labels. For example, consider the task statement TEST/INSPECT ANEMOMETERS. INSPECT in this instance can be construed as EXAMINE, which in the definitions of the second-level labels under WEATHER SYSTEMS is considered to be a maintenance function. TEST, on the other hand, is defined as a troubleshooting function, based on the assumption that it requires more skill and proficiency to troubleshoot a piece of equipment than to maintain or repair it. Therefore, the task statement presented above was assigned the category label--TROUBLESHOOTING OF WEATHER SYSTEMS--and TEST was chosen as the action verb. The verb INSPECT was ignored because it was inconsistent with the categorization of the task statement as a troubleshooting function.

The task statement INSPECT, ADJUST, AND REPLACE BRUSHES ON MOTORS AND GENERATORS affords an example of another convention. There are three action verbs--INSPECT, ADJUST, and REPLACE. INSPECT converts to EXAMINE. Both EXAMINE and ADJUST are considered to be maintenance activities according to the dictionary of category labels, while REPLACE is considered to be a repair activity in the dictionary. Therefore, because two of the three action verbs led to the selection of the same category label, this task statement was assigned the category label--MAINTENANCE OF ELECTRIC/ELECTRONIC EQUIPMENT. EXAMINE and ADJUST were used as action verbs, but REPLACE was ignored. Cases where multiple action verbs would lead to the assignment of different category labels were not numerous, but they were frequent enough to warrant establishing a convention to ensure that they would be content analyzed consistently.

Applications

Once the content analysis methodology was developed and defined, its application went very smoothly.[2] The basic methodology was developed by the principal investigator and applied to the 337 task statements in the TM task inventory booklet. These judgments were studied by a second individual who, using the dictionaries of category labels and action verbs and the glossary of equivalences between task statement verbs and approved action verbs, applied the methodology to the other four ratings. These judgments were reviewed by the principal investigator, and where there were disagreements, dictionary definitions were tightened to remove ambiguities.

The descriptive results of the content analysis are documented in Appendix F, Volume II, which forms the basic data base for a taxonomic comparison across ratings. The development of this taxonomic approach is described in the next section. In addition, the content analysis results have other potential applications that are particularly important for Navy enlisted training. For example, they provide a reasonable and sensible link between occupational standards and task analysis. The content analysis methodology maps directly onto occupational standards--both the category labels and the action verbs. What has been added is a greater degree of specificity and a carefully prepared definition for each category label and new action verb, definitions that reflect the actual content of task statements. The functional duty categories of the task inventory booklets have been tied directly to occupational standards taxonomies.

The content analysis definitions can serve as a starting point for generating task statements. Task statements, as they presently are formulated, are imprecise and inconsistent among task inventory booklets. A significant degree of precision, consistency, and definition can be added by reviewing existing task statements using the methodology developed in this project. One result might be a pool of standardized task statements that could be used to create new task inventory booklets and training curricula.

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[2]The procedures followed in applying this methodology can be documented in a training manual. Similar manuals have been prepared to document the methodology used in content analyzing the narrative sections of performance evaluations for senior enlisted personnel (Ramsey-Klee & Richman, 1973; Ramsey-Klee & Richman, 1975). These manuals were used to train a group of indexers who then independently indexed the same body of narrative performance evaluations. Their indexing judgments provided the data base for a reliability study. There was neither time nor resources to conduct a formal reliability check in the current project. The way in which the content analysis was conducted, however, strongly suggested that the results are reliable.

TAXONOMIC APPROACHES TO ENLISTED OCCUPATIONAL CLASSIFICATION

In this section, the data base developed by the content analytic method is used to demonstrate a procedure to perform inter-rating comparisons of: (1) the proportionate frequency of task statements (in each rating inventory booklet) that fell within each of the functional duty categories, and (2) in an expanded analysis, the proportionate frequency of use of standard action verbs in a particular duty category. Then, another taxonomic approach--a computer-based hierarchical clustering procedure--is used to group job incumbents performing similar tasks into occupationally homogeneous subgroups (i.e., clusters), to compare the consistency with which those incumbents selected similar job titles.

Content Analytic Approach

In Appendix F, Volume II, the frequency of selection of each category label for the five ratings is shown to the right of the label and is called Frequency Summary. In Table 8 these frequencies are standardized as a percentage of the total number of task statements for each rating so that cross-rating comparisons are possible. Comparisons are shown for all the category labels that were used in the content analysis.

A clear picture emerges from Table 8 of the functions that are performed by job incumbents in each of the five ratings. Most of the cross-rating comparisons match one's expectations. For example, the label "Corrosion Control and Material Preservation," a maintenance function, was used for the AD rating exclusively. ABs and TMs perform more tasks associated with "Damage Control" than ADs, ETs, and YNs, since damage control functions probably are more closely related to the assigned battle stations of the former group than the latter.

It is surprising that no task statements in the AD task inventory booklet dealt with "Drills, Inspections, and Command Military Functions" whereas these activities were represented in the other four ratings in about the same proportion. This omission perhaps can be explained by the fact that a section called PART D--GENERAL QUARTERS AND WATCH DUTIES is included in the task inventory booklets for ABs and ADs but is absent in the task inventory booklets for the other three ratings. Consequently, these activities are covered in PART D rather than included in the task statements section. The .2 percent entry for ABs was generated by a single task statement--PARTICIPATE IN "HANG-FIRE" DRILLS. The lack of any entry for ADs under "Watch Standing" and "Work Detail or Party" also can be explained by these activities being included in PART B rather than phrased as task statements. For ABs these activities appear both in PART B and as task statements.

Three of the more interesting lines in Table 8, corresponding to the category labels "Controlling," "Safety," and "Security," were singled out for further analysis.

In Table 9 the "Controlling" category label line in Table 8 has been expanded to show the frequency of selection of action verbs in the second step of the content analysis for those task statements categorized as "Controlling." This expansion identifies the specific actions taken by the incumbents in each rating in performing the controlling function. Additionally, it shows the relative proportions of time that the ratings devote to these actions. For example, Table 9 shows that the controlling actions taken by Yeomen involve determining, ensuring, inspecting, monitoring, reviewing, screening, and submitting tasks, a conclusion that is consonant with the job duties of the YN ratings. It also reveals that approximately half of the AD controlling task statements involve conducting inspections, while about 40 percent of the TM controlling task statements do. Certain action verbs--for example, the first nine--were used for task statements in only one rating.

Table 8

A Comparison of the Frequency of Selection of Category Labels in the Content Analysis for Five Navy Enlisted Ratings Standardized as a Percentage of Total Number of Task Statements

Category Label	Navy Enlisted Rating				
	AB %	AD %	ET %	TM %	YN %
Aircraft Fueling and Lubrication	15.0	2.2			
Aircraft Handling	7.6	4.4			
Aircraft Launch and Recovery	33.9	.5			
Aviation Support	6.4	3.2			
Chaplain Support					2.1
Clerical Functions	2.3	4.0	6.2	4.7	71.4
Communication	.5	.5	.8	1.5	2.3
Conduct of Training	.7	.7	.5	1.2	1.1
Construction/Fabrication of Aircraft Systems	.5	.2			
Construction/Fabrication of Electric/Electronic Equipment			.8	.3	
Construction/Fabrication of Weapon and Missile Systems				.6	
Controlling	3.2	8.9	3.0	6.5	3.0
Corrosion Control and Material Preservation		3.7			
Damage Control	8.8	.7	.7	5.3	.2
Drills, Inspections, and Command Military Functions	.2		.5	.6	.6
Electronic Warfare			1.7		
Graphics Support	.2				.9
Hydraulic/Pneumatic Maintenance	2.1	2.7		3.6	
Information Release/Promulgation	.9	1.2	.7	1.5	6.4
Information Retrieval and Data Analysis	.2	.2	.2	.3	.2
Installation of Aircraft Systems	.2	.5			
Installation of Broadcasting Systems			.2		
Installation of Communications and Cryptographic Systems			.2		
Installation of Electric/ Electronic Equipment		.2	.8	.9	
Installation of Radar/Sonar Systems			.3		
Installation of Weapon and Missile Systems				2.4	

Table 8 (Continued)

Category Label	Navy Enlisted Rating				
	AB %	AD %	ET %	TM %	YN %
Knowledge of Aircraft Systems	3.0	2.2			
Knowledge of Electric/ Electronic Equipment			1.3	1.8	
Knowledge of Radar/Sonar Systems			.2		
Knowledge of Weapon and Missile Systems				1.2	
Landing Party				1.2	
Leadership and Supervision	.7	3.0	1.2	2.4	2.6
Legal/Disciplinary Support					14.9
Logistics	3.2	5.0	4.0	8.3	2.1
Maintenance of Aircraft Systems	1.6	13.6			
Maintenance of Broadcasting Systems			1.7		
Maintenance of Communications and Cryptographic Systems	.2		7.9		
Maintenance of Data Processing/ Computing Equipment		3.5			
Maintenance of Electric/ Electronic Equipment	.2	.5	11.6	3.0	
Maintenance of Navigation Systems			2.7		
Maintenance of Office Equipment					.6
Maintenance of Radar/Sonar Systems			3.8		
Maintenance of Weapon and Missile Systems				7.1	
Maintenance of Weather Systems			1.7		
Mechanical Maintenance	6.2	2.0	.5	1.2	
Meetings, Seminars, and Conferences	.2	.2	.2	.3	.2
On-the-job Training			1.0		.2
Operation of Aircraft Systems		.2			
Operation of Data Processing/ Computing Equipment					.2
Operation of Office Equipment	.2				.8
Operation of Radar/Sonar Systems				.6	
Operation of Weapon and Missile Systems				8.6	
Organization	.7	.5	1.3	1.2	.8
Personnel Support	.2	.5	.2	.3	5.1
Planning	.7	.5	.5	1.5	1.7

Table 8 (Continued)

Category Label	Navy Enlisted Rating				
	AB %	AD %	ET %	TM %	YN %
Repair of Aircraft Systems	1.8	54.0			
Repair of Broadcasting Systems			1.7		
Repair of Communications and Cryptographic Systems			7.0		
Repair of Electric/Electronic Equipment	.2	1.0	7.0	6.2	
Repair of Navigation Systems			2.7		
Repair of Radar/Sonar Systems			3.0		
Repair of Weapon and Missile Systems				14.5	
Repair of Weather Systems			1.2		
Reporting		.5	1.8	2.7	9.1
Representation		.7	.5	.6	.2
Safety	2.8	2.2	.8	1.8	
Seamanship				.3	
Security		.2	.3	1.5	4.2
Social Functions Support		.2			
Staffing	1.4	1.0	.7	.9	1.5
Training Administration	.9	.5	1.3	3.0	4.7
Training Development	.9	1.2	1.2	3.6	1.3
Troubleshooting of Aircraft Systems	4.6	5.0			
Troubleshooting of Broadcasting Systems			2.5		
Troubleshooting of Communications and Cryptographic Systems			9.2		
Troubleshooting of Data Processing/Computing Equipment			3.5		
Troubleshooting of Electric/Electronic Equipment		.5	7.9	3.0	
Troubleshooting of Navigation Systems			3.5		
Troubleshooting of Radar/Sonar Systems			4.5		
Troubleshooting of Weapon and Missile Systems			.2	5.0	
Troubleshooting of Weather Systems			1.7		
Watch Standing	.5		1.3	1.2	4.5
Work Detail or Party	.9		.7	1.5	.6

Table 9

Expansion of the "Controlling" Category Label Line in Table 8 to Show the Frequency of Selection of Action Verbs in the Content Analysis

Action Verbs for "Controlling"	Navy Enlisted Rating AB %	AD %	ET %	TM %	YN %
Advise			.17		
Analyze				.30	
Approve		.74			
Audit		.25			
Check				.30	
Conduct	.23				
Control				.30	
Determine					.38
Ensure					.19
Evaluate			.17	.30	
Inspect	1.38	4.20	.50	2.66	.19
Investigate		.50			
Maintain				.30	
Monitor		.25			.38
Participate	.23				
Prepare			.17		
Recommend		.50			
Report			.17	.59	
Requisition				.89	
Review	.46	.74	.67	.59	1.50
Screen	.92	1.73	.67	.30	.19
Submit					.19
Verify			.50		
TOTALS	3.22	8.91	3.02	6.53	3.02

Table 10 depicts the expansion of the "Safety" category line in Table 8. Using the TOTALS line in Table 10, it is possible to rank the five ratings in the order of their involvement with safety tasks. Of the five ratings studied, ABs are the most involved with safety, further confirmed by the variety of action verbs used to describe their safety activities. ADs rank next in amount of involvement with safety, followed by TMs and ETs. No task statement in the YN task inventory booklet concerned safety.

Table 10

Expansion of the "Safety" Category Label Line in Table 8 to Show the Frequency of Selection of Action Verbs in the Content Analysis

Action Verbs for "Safety"	Navy Enlisted Rating				
	AB %	AD %	ET %	TM %	YN %
Certify		.25			
Comply	.23				
Distribute	.23		.17	.30	
Ensure	.23				
Inspect	.69	.25	.50		
Install				.30	
Investigate		.98			
Maintain	.23				
Paint	.23				
Perform				1.18	
Repair	.23				
Replace	.23				
Serve	.23	.25			
Test		.25	.17		
Wire	.23	.25			
TOTALS	2.76	2.23	.84	1.78	.00

In Table 11 the "Security" category label line in Table 8 has been expanded. Ranking the five ratings by the percentages shown in the TOTALS line shows that the YN task inventory booklet contained the highest percentage of task statements dealing with security procedures. The percentage of TM task statements concerned with security is about one-third that of YNs; the percentages for ADs and ETs, less than one-tenth. No task statements dealing with security appeared in the AB task inventory booklet, either by design or by oversight. The list of action verbs in Table 11 provides a quick overview of security actions: briefing personnel on security procedures; changing lock and safe combinations; destroying classified materials; inventorying and logging classified materials and maintaining logs and records; marking and packing classified materials for mailing or shipment; organizing departmental/division security; preparing and typing classified documents, records, and reports; standing security watches; and testing security alarm systems.

A table similar to Tables 9, 10, and 11 can be prepared for any line in Table 8 that generates sufficient interest. All of the data needed to do so are contained in Appendix F.

Clustering Approach

Rationale and Methodology

In the clustering approach, the topics for analysis were (1) the job titles selected by job incumbents from the task inventory booklets and (2) membership in one of the clusters determined by the GROUP clustering program in CODAP (Comprehensive Occupational Data Analysis Programs). The clustering algorithm in the GROUP program bases the definition of clusters on the percentage of time spent in performing the tasks itemized in the task inventory booklet. The clusters are independent of job titles and are based only on the responses of job incumbents regarding how much time they spend on each task listed in the task inventory booklet. Another CODAP program--PRTVAR--prints for each individual those variables (for example, job titles or pay grades) from the appropriate task inventory booklet that have been selected for study and lists them cluster by cluster. From such a listing for the AD rating, it was possible to cross-tabulate job titles selected by cluster membership.

This approach had its genesis in the notion that if the members of a cluster could be characterized by a single job title or by a homogeneous set of job titles, then one could conclude that job titles, although often cryptic and general, do have a common interpretation to the job incumbents who selected them. Conversely, if a particular job title is not concentrated in one or a few clusters, then one might conclude either that it is a heterogeneous job or that the job title is ambiguous and means different things to different people. This conclusion would cast suspicion on the usefulness of the job title.

The AD rating was chosen for this study because the results of the AD cluster analysis were less ambiguous than those for the other four ratings. Although there are 2568 cases in the AD sample, only 2000 cases were clustered. This truncation feature is a limitation of the IBM 360/370 version of CODAP, which cuts off at 2000 randomly selected cases. The sample size for this analysis was reduced further because not all of the 2000 cases that were analyzed by CODAP were assigned to a cluster. Also, clusters with 20 or fewer members were excluded from this analysis. A cross-tabulation was performed on 1367 AD cases, 68 percent of the 2000 randomly selected cases in the AD sample. Currently, there is no easy way to perform such a cross-tabulation by computer, so it was done by hand. The other four ratings could be analyzed in a similar fashion.

Table 11

Expansion of the "Security" Category Label Line in Table 8 to Show the Frequency of Selection of Action Verbs in the Content Analysis

Action Verbs for "Security"	Navy Enlisted Rating				
	AB %	AD %	ET %	TM %	YN %
Brief					.19
Change		.25		.30	.19
Destroy			.17	.30	.19
Inventory			.17		.19
Log					.75
Maintain					.38
Mark					.19
Organize				.30	
Package/Pack					.19
Prepare					.94
Report					.19
Stand				.30	.19
Test				.30	
Type					.57
TOTALS	.00	.25	.34	1.50	4.16

Results

It was possible to define 16 nonoverlapping clusters for the AD rating based on the solution from the GROUP program. For the 1367 cases in these clusters, 42 job titles were selected by ADs from the total set of 58 choices in the AD task inventory booklet. Some of the job title selections were invalid and some were write-ins. A huge 16-by-44 matrix of cross-tabulations was constructed from the data in the PRTVAR listing. The resulting frequencies for each cell of this matrix were converted to two different percentages to aid in interpretation. The entire matrix of job titles by clusters for the AD rating is depicted in Appendix G, Volume II, where the job titles are listed in decreasing frequency of selection in the total AD sample.

Consider the first cell in the matrix, corresponding to the "500 Laborer" job title and Cluster 1. The number on the top line in bold font--34--indicates that 34 ADs who selected "500 Laborer" as their job title fell into Cluster 1. The number in regular font on the second line--24.3--means that 24.3 percent of all ADs in this analysis who selected "500 Laborer" as their job title fell into Cluster 1. The number in italic font on the third line--21.8--means that 21.8 percent of all ADs in Cluster 1 selected "500 Laborer" as their job title.

A careful perusal of Appendix F yields many interesting findings. "500 Laborers" comprise the basic aviation maintenance work force and are involved in general maintenance rather than being identified with a particular maintenance specialty. The heterogeneity of tasks performed by "500 Laborers" is clearly shown in Appendix F, where "500 Laborers" fall into 10 of the 16 clusters. "Work Center Supervisor" is another heterogeneous job title, falling into 13 of the 16 clusters.

"Plane Captain" affords an interesting contrast. Of the 176 ADs in this analysis who selected "Plane Captain" as their job title, 152 (86.4%) fell into Cluster 10 and accounted for 65 percent of its members. Thirty of the 31 ADs (96.8%) selecting "Line Crewmember" as their job title also fell into Cluster 10. Together, these two job titles account for 77.8 percent of the membership of Cluster 10 and certainly provide good clues for deriving a descriptive name for this cluster.

"Maintenance Control Chief" appears to be an even more homogeneous job title. Of the 55 ADs who selected this job title, 51 (92.7%) fell into Cluster 15 and account for 79.7 percent of its members. It would seem reasonable to name Cluster 15 by this job title, since there is such a heavy concentration of Maintenance Control Chiefs in it.

Even more dramatic is the job title "Test Cell Operator." There were 18 ADs in this analysis who selected this job title, and all of them fell in Cluster 9, accounting for 78.3 percent of its members. The other five members selected three different job titles--"500 Laborer" (N = 2), "Work Center Supervisor" (N = 2), and "Maintenance Crewmember" (N = 1). Cluster 9 probably could be named "Test Cell Operator" without much risk of misrepresentation.

Two other job titles also are concentrated in individual clusters. Of the 56 ADs who selected "Quality Assurance Representative" as their job title, 50 (89.3%) fell into Cluster 16, accounting for 76.9 percent of the members of this cluster. Of the 46 ADs who selected "Complete Engine Repair (CER) Crew Leader" as their job title, 38 (82.6%) fell into Cluster 8, accounting for approximately one-third of the members of this cluster.

The most gratifying finding in Appendix G is that many job titles grouped fairly cleanly into unique clusters. This result supports a feeling of confidence that certain job

titles as they presently are formulated--at least in the AD rating--appear to be universally understood and correspond in many instances to well-defined clusters derived from task statement response data. Many other job titles, however, did not fall cleanly into a cluster (in Appendix F, see the row values for "500 Laborer," "Turbo-Shaft Mechanic," "Line Troubleshooter," and "'SAR' Crewmember").

Job Titles Versus Pay Grade

The results portrayed in Appendix G can be carried to another level of detail by adding a third variable--pay grade--to the analysis. This step was carried out for Clusters 1 and 2 as an illustration of yet another taxonomic approach. Table 12 is a display of the matrix of job titles selected by ADs in Cluster 1 versus pay grade. The most populus pay grades in this table are E-4 and E-5. Cluster 1 seems to be a mixed bag. From a study of Table 12, it is obvious that certain job titles correspond to higher or lower pay grades. For example, there are no "Work Center Supervisors" below Pay Grade E-5, and the majority (61.5%) are E-6s. This is the only job title in Table 12 where job incumbents are E-7s. The rest of the members of Cluster 1 are scattered across job titles and pay grades, but they are concentrated at the apprentice and journeyman pay grade levels.

Table 13 presents a similar display for Cluster 2, cross-tabulating job titles with pay grade. Once again, E-4 and E-5 are the most populous pay grades. Cluster 2 also contains a variety of job titles, but the most frequent ones are "Plane Captain" and "Aircrew Member (Fixed Wing)," suggesting that this cluster corresponds mostly to ADs who spend time in the air on fixed wing aircraft rather than in ground-based aircraft maintenance. (This includes a "flying" Plane Captain, although most Plane Captains do not have aircrew duties--see Cluster 10 in Appendix G.) This cluster, however, cannot be clearly defined from the job titles in it. A study of the task statements contributing to the cluster composition would be necessary to name this cluster with any degree of confidence. Clearly, it does not involve senior enlisted personnel in the AD rating, since Pay Grades E-7 through E-9 are not represented.

Similar detailed analyses of the pay grade breakdown can be made across job titles for clusters or across clusters for job titles. At present, such nested cross-tabulations have to be performed by hand tally and count. But they could be done by standard statistical computer programs if identification of cluster membership could be added to the computer record of each job incumbent's responses to the task inventory booklet. Another approach would be to create a small working file of key variables (e.g., pay grade, job title, and sex) for a rating that contained some sort of identifying case number. This same identifying case number and some identification of cluster membership could be prepared in machine-readable form and merged with the small working file of key variables. The result would be a specialized but highly manageable data file whose computer processing would not incur the substantial costs now involved in passing the entire AD file of 2568 cases, wherein each individual's response data comprise a data block consisting of 2320 characters.

Discussion

The question of the usefulness of job titles, as they presently are generated, can be considered in the light of three important personnel management decision functions: (1) definition of the occupational structure, (2) distribution or assignment of personnel, and (3) development of curricula. The present structure is defined by about 70 general ratings and 1000 (more specialized) classification codes (NECs). Imposing an additional category or level of specificity with job titles probably would increase the burden of updating

Table 12

Matrix of Job Titles by Pay Grade for the 156 Aviation Machinist's Mates (AD) in Cluster 1

Job Title	Pay Grade 2	3	4	5	6	7	Sum
500 Laborer		2	18	13	1		34
		5.9%	52.9%	38.2%	2.9%		
		11.8%	30.0%	22.8%	5.6%		
Plane Captain			1				1
			100.0%				
			1.7%				
Work Center Supervisor				3	8	2	13
				23.1%	61.5%	15.4%	
				5.3%	44.4%	100.0%	
Maintenance Crewmember		5	11	10			26
		19.2%	42.3%	38.5%			
		29.4%	18.3%	17.5%			
Engine Build-up Mechanic		1	2	2			5
		20.0%	40.0%	40.0%			
		5.9%	3.3%	3.5%			
Assistant Shop Supervisor			2	5	8		15
			13.3%	33.3%	53.3%		
			3.3%	8.8%	44.4%		
Power Plants Troubleshooter		4	15	12			31
		12.9%	48.4%	38.7%			
		23.5%	25.0%	21.0%			
Quality Assurance Representative				1			1
				100.0%			
				1.8%			
Complete Engine Repair (CER) Crew Leader	1			3			4
	25.0%			75.0%			
	50.0%			5.3%			
Turbo-shaft Mechanic				1			1
				100.0%			
				1.8%			
Check Crewmember		4	7	4			15
		26.7%	46.6%	26.7%			
		23.5%	11.6%	7.0%			
Aircrew Member (Fixed Wing				2			2
				100.0%			
				3.5%			
Administrative PO/CPO			1				1
			100.0%				
			1.7%				
Check Crew Leader			1		1		2
			50.0%		50.0%		
			1.7%		5.6%		
Line Troubleshooter	1	1	1				3
	33.3%	33.3%	33.3%				
	50.0%	5.9%	1.7%				
Propeller Mechanic			1	1			2
			50.0%	50.0%			
			1.7%	1.8%			
SUM	2	17	60	57	18	2	156

Note. The top line for each job title shows the frequencies. The numbers on the second line present row percentages for the job title subgroup across pay grades, while the numbers on the third line present column percentages for the pay grade subgroup across job titles.

Table 13

Matrix of Job Titles by Pay Grade for the 28 Aviation Machinist's Mates (AD) in Cluster 2

Job Title	Pay Grade 3	4	5	6	Sum
500 Laborer	1 33.3% 50.0%	2 66.7% 15.4%			3
Plane Captain	1 16.7% 50.0%	1 16.7% 7.7%	3 50.0% 33.4%	1 16.7% 25.0%	6
Work Center Supervisor			1 100.0% 11.1%		1
Maintenance Crewmember		2 100.0% 15.4%			2
Engine Build-up Mechanic		2 100.0% 15.4%			2
Power Plants Troubleshooter			1 100.0% 11.1%		1
Flight Engineer		1 50.0% 7.7%		1 50.0% 25.0%	2
Maintenance Control Chief				1 100.0% 25.0%	1
Check Crewmember		1 100.0% 7.7%			1
Aircrew Member (Fixed Wing)		4 57.1% 30.7%	2 28.6% 22.2%	1 14.3% 25.0%	7
"SAR" Crewmember			2 100.0% 22.2%		2
SUM	2	13	9	4	28

Note. The top line for each job title shows the frequencies. The numbers on the second line present row percentages for the job title subgroup across pay grades, while the numbers on the third line present column percentages for the pay grade subgroup across job titles.

the structure and administering assignments. In regard to curriculum development, it is desirable to provide training as specific as possible to particular jobs. Although job titles reflect certain kinds of jobs, they do not appear to do so nearly as effectively as the derived clusters do. (Further, the clusters were, of course, derived by highly systematic and fully quantitative procedures, and can be defined very specifically by a subset of task elements.) At best, the job titles might be a useful starting point to generate brief cluster titles or descriptors. But other procedures (e.g., the taxonomic approaches developed in the present study) might be more effective. Further, cluster titles themselves, if generated, may serve no further use than one of many intermediate steps in the process of developing curricula. Thus, it appears that job titles serve no useful purpose that would justify, on a cost-effective basis, their identification and analysis for central management use. This view, however, should not necessarily discourage their informal generation and use at the unit level where titles may raise morale by instilling a sense of belonging and encouraging involvement in the job.

FINDINGS

1. Although none of the taxonomic methodologies surveyed could be used directly to analyze the task inventory data, elements of the Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards and concepts from several other publications were incorporated into a composite content analytic methodology. Additionally, a comprehensive and annotated bibliography was compiled and is available as a supplement to this report.

2. The content analysis of task inventories demonstrated that this procedure can be used effectively to compare Navy enlisted ratings, relate task analysis data to occupational standards, and generate more systematic task statements. Task statements, as they presently are formulated, are imprecise and inconsistent among task inventory booklets. A significant degree of precision, consistency, and definition could be added by reviewing existing task statements in the context of the categories developed in this project. One result might be a pool of standardized task statements that could be used to create new task inventory booklets and training curricula.

3. The cross-tabulations of job titles by membership in one of the occupational clusters showed that while some of the informal job titles requested in the inventories correspond to well-defined clusters derived from task statements and thus appear to be universally understood, others do not. This suggests that job titles reflect only certain kinds of jobs and do not identify these jobs as well as the derived clusters do. At best, job titles offer a useful starting point for generating brief cluster titles or descriptors. Even for this task, however, the content analytic procedure or clustering procedure might be more effective.

4. It appears that job titles serve no useful purpose that would justify, on a cost-effectiveness basis, their identification and analysis for central management use. This view, however, should not necessarily discourage their informal generation and use at the unit level.

RECOMMENDATIONS

1. The job title section should be deleted from task inventories, thereby reducing time demands to complete the inventory.

2. The content analytic method demonstrated in this study should be developed further, with emphasis on the highly technical equipment-oriented ratings and Navy Enlisted Classification codes, and evaluated for its usefulness (a) to perform cross-rating comparisons; (b) to link task statements and categories for a variety of applications, including occupational standards, curriculum development, and personnel resource requirements; and (c) to formulate systematic task statements.

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